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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/551,680	09/29/2005	Keigo Nagao	930055-2036	5620

7590 11/02/2006

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EXAMINER

ROSENAU, DEREK JOHN

ART UNIT	PAPER NUMBER
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2834

DATE MAILED: 11/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/551,680	Applicant(s) NAGAO ET AL.	
	Examiner Derek J. Rosenau	Art Unit 2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 September 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>9/29/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 41. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 2, 4, and 6 are objected to because of the following informalities: the language of these claims is grammatically incorrect. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Art Unit: 2834

4. Claims 1, 2, 5-8, and 11-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Masaki et al. (JP 2002223145).

5. With respect to claim 1, Masaki et al. discloses a piezoelectric thin film device (Fig 2) comprising a substrate (item 12) having a vibration space (see Figure A below), and a piezoelectric laminated structure (item 22) formed on an upper surface side of the substrate, the piezoelectric laminated structure including a piezoelectric film and electrodes formed respectively on both surfaces of the piezoelectric film (Paragraph 2), and the vibration space being formed so as to allow a vibration part to vibrate (Paragraph 8), the vibration part including at least a part of the piezoelectric laminated structure (Fig 2), wherein the vibration space is constituted by a first via hole (item 16) formed from a lower surface of the substrate toward an upper surface thereof with an intermediate surface (see Figure A below) formed at an intermediate position in the substrate, and a second via hole (see Figure A below) formed from the intermediate surface toward the upper surface of the substrate, the second via hole being positioned inside the first via hole when viewed in a vertical direction (see Figure A below).

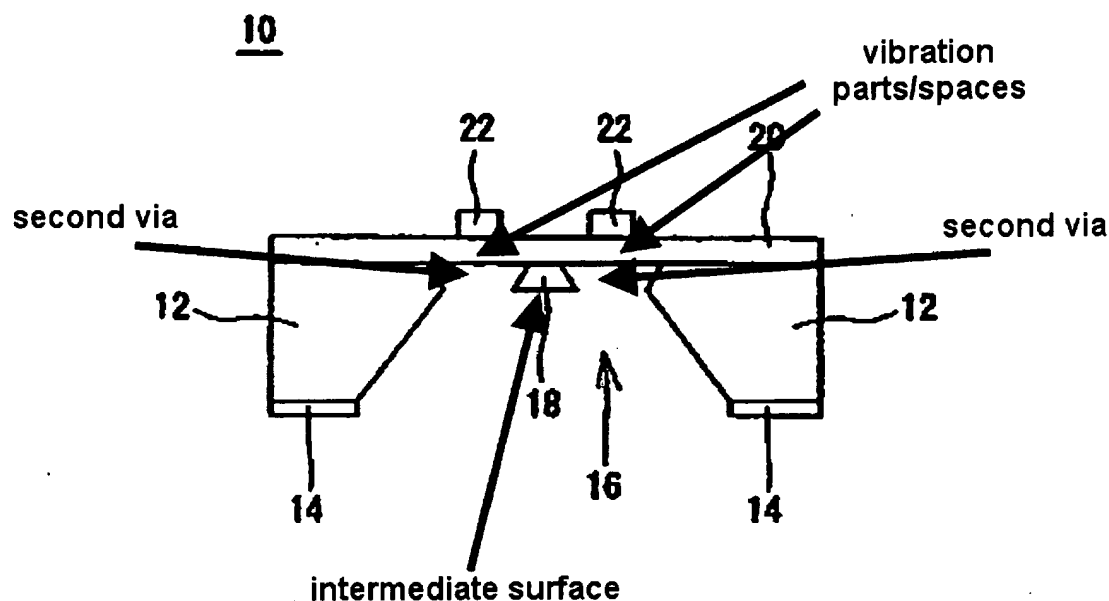


Figure A

6. With respect to claim 2, Masaki et al. discloses the piezoelectric thin film device as claimed in claim 1, wherein plural vibration parts each being the vibration part are formed on the upper surface side of the substrate (Fig 2), the first via hole is formed so as to share a part of each of vibration spaces respectively for the plural vibration parts (Fig 2), and plural second via holes each being the second via hole are formed from the intermediate surface (see Figure A above), so as to correspond respectively the plural vibration parts (see Figure A above).

7. With respect to the method claims 5-8 and 12-17, these claims are dependent on an apparatus claim; therefore, the method steps therein do not define any structural elements and are not germane to the structure of the device. Because of this, claims 5-8 and 12-17 are anticipated by Masaki et al. However, these claims are also unpatentable as described below.

Art Unit: 2834

8. With respect to claim 5, Masaki et al. discloses a method for manufacturing a piezoelectric thin film device (Fig 2) of claim 1, wherein when the vibration space in the substrate is formed, a first via hole is formed from a lower surface of a substrate toward an upper surface thereof (Fig 3K), so as to form a bottom surface of the first via hole at an intermediate position in the substrate (Fig 3K), a second via hole is thereafter formed from the bottom surface toward the upper surface of the substrate material (Figure 3L), to be positioned inside the first via hole when viewed in a vertical direction (Fig 3L or Fig 2), and the intermediate surface is formed by such a part of the bottom surface that remains in the substrate material (see Figure A above).

9. With respect to claim 6, Masaki et al. discloses the method as claimed in claim 5, wherein the piezoelectric thin film device has plural vibration parts each being the vibration part (see Figure A above), on the upper surface side of the substrate (see Figure A above), the first via hole is formed to be shared by the plural vibration parts (See Figure A above), plural second via holes being the second via hole are formed from the bottom surface, so as to correspond respectively to the plural vibration parts (see Figure A above).

10. With respect to claim 7, Masaki et al. discloses the method as claimed in claim 5, wherein a SOI wafer (Fig 2) is used as the substrate material, and the bottom surface of the first via hole is constituted by a part of an insulating layer thereof (Fig 3K).

11. With respect to claim 11, Masaki et al. discloses the piezoelectric thin film device as claimed in claim 2. While Masaki et al. does not disclose the frequency distribution of the devices, this is simply a parameter describing the goal of the invention. The

Art Unit: 2834

structure disclosed by Masaki et al. is the same as that of the claimed invention; therefore, the device of Masaki has a frequency distribution within .42%.

12. With respect to claim 14, Masaki et al. discloses the piezoelectric thin film device as claimed in claim 6. While Masaki et al. does not disclose the frequency distribution of the devices, this is simply a parameter describing the goal of the invention. The structure disclosed by Masaki et al. is the same as that of the claimed invention; therefore, the device of Masaki has a frequency distribution within .42%.

13. With respect to claim 15, the claimed subject matter is the same as that of claim 5 with the exception of its dependency; therefore, claim 15 is anticipated by Masaki et al. as in claim 5 above.

14. Claims 1 and 5 are rejected under 35 U.S.C. 102(b) as being unpatentable by Eiji et al. (JP 59086916).

15. With respect to claim 1, Eiji et al. discloses a piezoelectric thin film device (Fig 4) comprising a substrate (item 11) having a vibration space (Fig 4), and a piezoelectric laminated structure (items 12, 13, 14) formed on an upper surface side of the substrate, the piezoelectric laminated structure including a piezoelectric film (item 12) and electrodes formed respectively on both surfaces of the piezoelectric film (items 13 and 14), and the vibration space being formed so as to allow a vibration part to vibrate, the vibration part including at least a part of the piezoelectric laminated structure (Fig 4), wherein the vibration space is constituted by a first via hole (item 15) formed from a lower surface of the substrate toward an upper surface thereof with an intermediate surface (Fig 4) formed at an intermediate position in the substrate, and a second via

Art Unit: 2834

hole (item 17) formed from the intermediate surface toward the upper surface of the substrate, the second via hole being positioned inside the first via hole when viewed in a vertical direction (Fig 4).

16. With respect to the method claim 5, the method steps therein correspond to the structural elements claimed in claim 1; therefore, claim 5 is anticipated by Eiji et al. as in claim 1 above.

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

18. Claims 3, 4, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eiji et al.

19. With respect to claim 3, Masaki et al. discloses the piezoelectric thin film device as claimed in claim 1. Eiji et al. does not disclose expressly that the second hole is positioned, by at least 2 μm , inside the first via hole when viewed in a vertical direction. However, it has long been held that the mere change in size of a device is obvious (*In re Rose*, 105 USPQ 237). Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to change the dimensions of the second via such that it is at least 2 μm from the wall of the first via.

20. With respect to claim 4, Eiji et al. discloses the piezoelectric thin film device as claimed in claim 1. Eiji et al. does not disclose expressly that the second via holes have

Art Unit: 2834

a depth of 10 μm to 150 μm . However, it has long been held that the mere change in size of a device is obvious. Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to change the dimensions of the second vias such that they have a depth of between 10 μm and 150 μm .

21. With respect to claim 9, Eiji et al. discloses the piezoelectric thin film device as claimed in claim 3. Eiji et al. does not disclose expressly that the second via hole is positioned inside by a distance of 5 μm to 50 μm from a peripheral part of a bottom surface of the first via hole. However, it has long been held that the mere change in size of a device is obvious. Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to change the dimensions of the second via such that it is between 5 μm and 50 μm from the periphery of the first via hole.

22. Claims 4, 10, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masaki et al.

23. With respect to claim 4, Masaki et al. discloses the piezoelectric thin film device as claimed in claim 1. Masaki et al. does not disclose expressly that the second via holes have a depth of 10 μm to 150 μm . However, it has long been held that the mere change in size of a device is obvious (*In re Rose*, 105 USPQ 237). Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to change the dimensions of the second vias such that they have a depth of between 10 μm and 150 μm .

24. With respect to claim 10, Masaki et al. discloses the piezoelectric thin film device as claimed in claim 1, wherein an insulating layer (item 20) is formed between the upper

Art Unit: 2834

surface of the substrate and the piezoelectric laminated structure (Fig 2), the vibration part includes a part of the insulating layer (See Figure A above). Masaki et al. does not disclose expressly that the insulating layer has a thickness of .3 μm to .5 μm . However, it has long been held that the mere change in size of a device is obvious. Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to change the thickness of the insulating layer such that it between .3 μm and .5 μm .

25. With respect to the method claims 16 and 17, the claimed subject matter is the same as that of claims 5 and 15 with the exception of their dependencies; therefore, claims 16 and 17 are unpatentable over Masaki et al. as above.

26. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masaki et al. or Eiji et al. in view of Wang et al. (US 6662419).

27. With respect to claim 8, both Masaki et al. and Eiji et al. disclose the method as claimed in claim 5.

Neither Masaki et al. or Eiji et al. disclose that the second via hole is formed by a deep reactive ion etching method.

Wang et al. teaches a film bulk acoustic resonator in which a via is formed by deep reactive ion etching (column 5, lines 25-29).

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the deep reactive ion etching of Wang et al. with the piezoelectric thin film device of Masaki et al. or Eiji et al. for the benefit of the increased etching speed of deep reactive ion etching.

Art Unit: 2834

28. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masaki et al. or Eiji et al. in view of Sunwoo et al. (US 20020067106).

29. With respect to claim 12, both Masaki et al. and Eiji et al. disclose the method as claimed in claim 5.

Neither Masaki et al. nor Eiji et al. disclose that when forming the second via, photo-resist is coated on the bottom surface of the first via hole at a thickness of .5 μm to 4 μm , then the photo-resist is patterned by removing a part thereof corresponding to the vibration part, the vibration part being positioned inside by a distance of 2 μm or more from the peripheral part of the bottom surface of the first via hole, then the substrate is etched with the patterned photo-resist used as a mask. However, it has long been held that the mere change in size of a device is obvious (*In re Rose*, 105 USPQ 237). Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to change the dimensions of the second via such that it is at least 2 μm from the wall of the first via.

Sunwoo et al. teaches the use of a patterned layer of photo-resist as an etching mask to remove material to form a cavity (Abstract). Sunwoo et al. does not teach the thickness of the etching material being between .5 μm and 4 μm . However, it has long been held that the optimization of a device by routine experimentation is obvious, as long as the modifications are within the capabilities of a person of ordinary skill in the art (*In re Aller*, 105 USPQ 233). As adjusting the thickness of a photo-resist layer to achieve the desired results is within the capabilities of a person of ordinary skill in the

Art Unit: 2834

art, it would have been obvious to a person of ordinary skill in the art to form the photo-resist layer with a thickness of .5 μm to 4 μm .

At the time of invention, it would have been obvious to a person of ordinary skill in the art to combine the photo-resist layer of Sunwoo et al. with the piezoelectric thin film device of Masaki et al. or Eiji et al. for the benefit of easily and efficiently removing the material to form the vias while leaving the surrounding material intact.

30. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Eiji et al. in view of Sunwoo et al.

31. With respect to claim 13, the combination of Eiji et al. and Sunwoo et al. discloses the method as claimed in claim 12. Eiji et al. does not disclose expressly that the second via hole is positioned inside by a distance of 5 μm to 50 μm from a peripheral part of a bottom surface of the first via hole. However, it has long been held that the mere change in size of a device is obvious (*In re Rose*, 105 USPQ 237). Therefore, at the time of invention, it would have been obvious to a person of ordinary skill in the art to change the dimensions of the second via such that it is between 5 μm and 50 μm from the periphery of the first via hole.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Derek J. Rosenau whose telephone number is 571-272-8932. The examiner can normally be reached on Monday thru Thursday 7:00-5:30.

Art Unit: 2834

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Darren Schuberg can be reached on 571-272-2044. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Derek J Rosenau
Examiner
Art Unit 2834

DJR
10/24/06


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